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# 1974 WATER QUALITY AND CURRENT METER DATA SUMMARY



Ontario

Ministry  
of the  
Environment

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1974  
WATER QUALITY  
AND  
CURRENT METER  
DATA SUMMARY

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## 1974 WATER QUALITY AND CURRENT METER DATA SUMMARY

This report presents a summary of the period of record obtained from water chemistry and water current automatic recording instruments operated by the Ontario Ministry of the Environment during 1974. Descriptions of the instrumentation, technical specifications, maintenance schedules, and support structures are also included. Automatic recording of water quality data was confined to locations at Hamilton Harbour on Lake Ontario and Nanticoke on Lake Erie. The current meter studies were conducted on Lake Ontario at Pickering, Lorne Park and Hamilton Harbour; on Lake Erie at Nanticoke; and on Lake Superior at Nipigon Bay in the vicinity of Red Rock (see Figures 1 and 2). All of the data are available on one half inch computer tape in a smoothed condition and are accessible through the appropriate FORTRAN program. Data requests should be directed to:

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### CURRENT METERS

Of the 22 automatic recording current meters operated by the Ontario Ministry of the Environment, ten were Plessey MO 21 meters, six were Geodyne 102 meters, two were Geodyne 850 meters and four were Geodyne 920 meters. Various recording methods and formats were used. The Plessey MO 21 employs binary code with ten bit words on 1/4" reel to reel magnetic tape. The Geodyne 102 uses Gray binary code with recording on 16 mm film. The Geodyne 850 and the Geodyne 920 effect recording on endless loop tape cartridges with data in the Gray binary code format (see Table 3).

No current meter servicing is performed in-house. Genelcom Limited presently has the maintenance contract for the Plessey MO 21, Geodyne 920 and 850 meters. George Kelk Limited services the Geodyne 102 meters. The meters are subjected to post-mooring checks, routine or extensive maintenance as needed, environmental chamber tests under simulated operating conditions and post-mooring checks.

### WATER QUALITY METERS

The inventory of automatic recording water chemistry meters consists of three Schneider Robot Monitors, two NERA Environmental Monitors, one Plessey prototype MM1 submersible water quality station, and one Plessey MM4 submersible unit.

The Schneider Robot Monitors are used primarily to measure near-shore water quality due to the need for 115 v.a.c. electrical power and the necessity for pumping the sample to the flow cells housed in the instrument. The six parameter data are punched onto paper tape in the BCD format. A rigorous calibration procedure is performed once a week and volume samples are submitted for laboratory analysis and subsequent data verification.

The NERA Environmental Monitors are battery operated and can be operated offshore by housing the recorder in a surface float. The submersible sensor assembly is lowered to the desired depth. Data are recorded in ASCII code on a magnetic tape cassette. The instrument is calibrated before and after mooring and grab samples are taken regularly to verify the accuracy of the recorded readings.

Both Plessey water quality meters are completely submersible. The batteries and electronic components are enclosed in a water-tight tube and the sensors are mounted in a flow block. Circulation of water past the sensors is ensured by use of a stirrer. The MM1 employs 1/4" reel-to-reel magnetic tape and the MM4 has a cassette type of recording medium. The MM1 is hand wired and has the battery pack attached beneath the electronics board. The MM4 has plug-in circuit boards and the battery pack is a separate unit which is water proof when attached to the instrument. M.O.E. personnel are responsible for the calibration and maintenance of the instruments. Volume samples at the site of deployment are collected at least twice per week to verify or to adjust the recorded values. Technical specifications of the instrumentation are presented in Table 4.

#### METER SUPPORT STRUCTURES

The offshore instrumentation is supported by either a submerged floatation drum, a surface float, a submerged tubular steel frame or a submerged steel tower.

The submerged floatation drum system comprises a ten gallon foam - filled steel drum connected to an anchor via 3/16" stainless steel cable with swivels at both ends. The meter is attached to the cable at the desired depth. An aluminum spar attached by cable to a separate anchor marks the location. This system is very easy to install and to remove and it is used in approximately 75% of the moorings.

For areas with very little wave action and where the top water layer is the zone of interest, a surface float is used with the meter suspended underneath. The float is attached by cable to an anchor resulting in some movement of the float within a small circle.

The submerged tubular steel frame is made of 1½" steel pipe. The dimensions are 8' long x 8' wide x 10' high. The meter is secured in the middle of the frame. Applications of this support system are obviously limited to the narrow band of bottom currents.

In locations where currents are too strong for floatation systems or where multiple mooring points are needed, the submerged steel tower is used. The steel tower is of the type used for commercial TV installations. It is attached to the center of a steel base which weighs approximately 3,000 lbs. and is ten feet square. Guy wires are attached from the tower to the corners of the base. The major drawback to this type of installation is the requirement of a large vessel equipped with suitable hoisting and boom facilities.

#### Data Summary

A graphical depiction of the length of record for each current meter location is presented in figures 3 and 4. Table 1 provides information (i.e. location, depth, sample interval, meter type, data length and support system employed) pertaining to each individual current meter implantment.

A water quality data summary is presented in figure 5 (Lake Ontario) and figure 6 (Lake Erie). Besides the period of record, the available parameters are also included. A water quality meter log listing information and data on each installation is presented in Table 2.

TABLE 1: CURRENT METER LOG 1974

Tape No.	Body of Water Lake	Location	Meter Type	Cam Setting Min.	Support System	Data Length (Days)	Temp.	Total Depth M	Depth From Bottom M	Meter Installed	Meter Removed
02701	Erie	Nanticoke	Plessey M021	20	Sub. Frame	No Data	-	6.7	1.5	April 19	August 7
02702	Erie	Nanticoke	Plessey M021	10	Sub. Frame	58	Available	6.7	1.5	August 7	October 11
02703	Erie	Nanticoke	Plessey M021								
02801	Erie	Nanticoke	Plessey M021	20	Sub. Float	68	Unreliable	7.0	2.0	April 19	June 27
02802	Erie	Nanticoke	M021	20	Sub. Float	8	Available	7.0	2.0	July 17	October 11
02803	Erie	Nanticoke	M021	10	Sub. Float	14	Available	7.0	2.0	October 11	November 27
16101	Superior	Nipigon Bay	Geodyne 102	10	Sub. Float	21	No Sensor	11.9	6.1	July 25	September 10
16201	Superior	Nipigon Bay	102	10	Sub. Float	No Data	No Sensor	12.2	6.7	July 25	September 10
16301	Superior	Nipigon Bay	102	10	Sub. Float	49	No Sensor	11.6	6.4	July 29	September 10
11501	Ontario	Hamilton H.	Geodyne 920	5	Sur. Float	34	Unreliable	4.6	4.0	June 13	July 18
11601	Ontario	Hamilton H.	920	5	Sub. Float	38	Unreliable	18.3	14.6	June 13	July 22
11801	Ontario	Hamilton H.	Plessey M021	10	Sub. Float	33	Available	10.7	5.5	June 14	July 22
11101	Ontario	Hamilton H.	Plessey M021	10	Sub. Float	38	Available	9.4	6.1	June 13	July 22
11201	Ontario	Hamilton H.	M021	10	Sub. Float	38	Available	9.4	2.1	June 13	July 22
15201	Ontario	Lorne Park	Geodyne 920	20	Sub. Float	69	Available	11.6	2.4	May 30	August 9
15401	Ontario	Lorne Park	Geodyne 850	20	Sub. Frame	60	Available	11.9	2.1	May 30	August 9
15501	Ontario	Lorne Park	Geodyne 850	20	Sub. Float	60	No Sensor	11.6	2.4	May 30	August 9
15601	Ontario	Lorne Park	Geodyne 850	20	Sub. Float	60	No Sensor	13.1	2.4	May 30	August 9
01501	Ontario	Pickering	Geodyne 102	20	Sub. Float	50	No Sensor	12.2	6.1	August 23	October 30
01601	Ontario	Pickering	Plessey M021	10	Sub. Float	25	Available	12.2	6.1	August 23	November 1
01801	Ontario	Pickering	Geodyne 102	20	Sub. Float	54	No Sensor	12.2	6.1	August 23	October 10

\* First two digits indicate general area.  
Middle digit indicates specific location and depth.  
Final two digits indicate sequence of meter arisings during calendar year for specific location.

N.B. Number 9 in 4th digit location indicates water quality meter.

TABLE 2: WATER QUALITY METER LOG 1974

Tape No.	Body of Water Lake	Location	Meter Type	Sample Interval Min.	Support System	Data		Meter Depth From Bottom M	Meter Installation Date	Meter Removal Date
						Length (Days)	Total Depth M			
02791	Erie	Nanticoke	Nera	30	Sur. Float	6	6.1	3.0	August 7	August 13
02792	Erie	Nanticoke	Nera	30	Sur. Float	2	6.1	3.0	October 10	October 18
02793	Erie	Nanticoke	Nera	30	Sur. Float	7	6.1	3.0	October 18	October 25
02991	Erie	Nanticoke	Nera	30	Sur. Float	3	6.1	5.5	August 7	August 13
02992	Erie	Nanticoke	Nera	30	Sur. Float	8	6.1	5.5	October 10	October 18
11191	Ontario	Burlington C.	Schneider	10	Shore Mounted	7	9.4	6.1	June 27	July 4
11192	Ontario	Burlington C.	Schneider	10	Shore Mounted	No Data	9.4	6.1	July 4	July 16
11193	Ontario	Burlington C.	Schneider	10	Shore Mounted	6	9.4	6.1	July 16	July 22
11291-2	Ontario	Burlington C.	Schneider	10	Shore Mounted	13	9.4	2.1	June 29	July 12
11293	Ontario	Burlington C.	Schneider	10	Shore Mounted	6	9.4	2.1	July 16	July 22
11691	Ontario	Hamilton H.	Nera	30	Sur. Float	12	18.3	14.6	June 25	July 7
11692	Ontario	Hamilton H.	Nera	30	Sur. Float	11	18.3	14.6	July 11	July 22
11791	Ontario	Hamilton H.	Nera	30	Sur. Float	10	18.3	6.1	June 25	July 5
11792	Ontario	Hamilton H.	Nera	30	Sur. Float	11	18.3	6.1	July 11	July 22
11891	Erie	Hamilton H.	Plessey MM1	60	Sub. Float	14	10.7	5.5	June 25	July 9



TABLE 3: CURRENT METER TECHNICAL SPECIFICATIONS

Type (Units)	Parameters	Velocity and Direction Sensors	Threshold Velocity cm/s	Velocity Range and Accuracy	Compass Resolution	Recording Medium	Recording Code
Plessey M021 (10)	Velocity Direction Temperature	Propellor and Vane	3.0	3.0-250 cm/s + 3% or 3 cm/s whichever is greater	2°	Reel-Reel 1/4" Mag. Tape	Binary
Geodyne 850 (2)	Velocity Direction	Savonius Rotor and Vane	0.5	0.5-103 cm/s within 2.57 cm/s for speeds <51.4 cm/s	2.8°	Mag Tape endless-Loop cartridge	Gray Binary
Geodyne 920 (4)	Velocity Direction Temperature	Savonius Rotor and Vane	0.5	0.5-103 cm/s within 2.57 cm/s for speeds <51.4 cm/s	2.8°	Mag Tape Endless-Loop Cartridge	Gray Binary
Geodyne 102 (6)	Velocity Direction	Savonius Rotor and Vane	0.5	0.5-103 cm/s within 2.57 cm/s for speeds <51.4 cm/s	2.8°	16 MM Film XX Neg.	Gray Binary

TABLE 4 WATER QUALITY METER TECHNICAL SPECIFICATIONS

Type (Units)	Parameters	Range	Accuracy	Power Source	Instrument Attitude	Recording Medium	Recording Code
Plessey W.Q.M. 1 (2)	Temperature	0-26°C	$\pm 0.3^{\circ}\text{C}$	3 rechargeable	completely self	Reel-Reel	Binary
	DO	0-130% Sat.	$\pm 5\%$	NICAD batteries	contained;	1/4" Mag	
	pH	4-10 SU	$\pm 0.2\text{SU}$	1-6 V	sensors at depth;	Tape	
	Cond.	10-1,000 $\mu\text{mhos/cm}$	$\pm 3.2$ at 10	2-12V	max. depth 33M		
			$\pm 4.2$ at 1000				
	Turb.	0-100 ppm	$\pm 1.5$ ppm at 0				
			$\pm 10$ ppm at 100				
	Pressure	0-500 kPa	$\pm 2\%$				
Plessey W.Q.M. IV (1)	Temperature	0-30°C	$\pm 0.3^{\circ}\text{C}$	2 rechargeable	completely self	Tape Cassette	Binary
	DO	0-130% sat.	$\pm 5\%$	NICAD batteries	contained; sensors	1/4" Mag.	
	pH	4-10 SU	$\pm 0.2\text{SU}$	1-+18V; 1-18V	at depth; max.		
	Cond.	10-1,000 $\mu\text{mhos/cm}$	$\pm 3.2$ at 10		depth 33M		
			$\pm 4.2$ at 1000				
	Turb.	0-100 ppm	$\pm 1.5$ ppm at 0				
			$\pm 10$ ppm at 100				
	Pressure	0-500 kPa	$\pm 2\%$				
Nera Environmental Monitor (2)	Temperature	-5°C-+45°C	$\pm 0.25^{\circ}\text{C}$	1 rechargeable	electronics	Tape Cassette	ASC11
	DO	0-20 ppm	$\pm 2\%$	12 V neg.	package is		
	pH	2-12 SU	$\pm 0.1\text{SU}$	battery	surface or shore		
	ORP	0-1000 mV	$\pm 5\text{mV}$		mounted; sensors		
	Cond.	0-1000 $\mu\text{mhos/cm}$	$\pm 0.5\%$ of range		at depth; max.		
	Depth	0-20M	$\pm 2\%$ of range		depth 30M		
Schneider Robot Monitor (3)	Temperature	0-120°F	$\pm 1/2\%$ of	110 AC	electronics	Punched Paper	IBM
	DO	0-24 mg/l	range		module and	Tape	BCD
	pH	0-14 SU			sensors are shore		
	Cond.	0-1200 $\mu\text{mhos/cm}$			mounted. Sample		
	Turb. (2)	0-48 FTU			pumped to sensors		
	Chloride (1)	0-600 ppm			max. depth -		

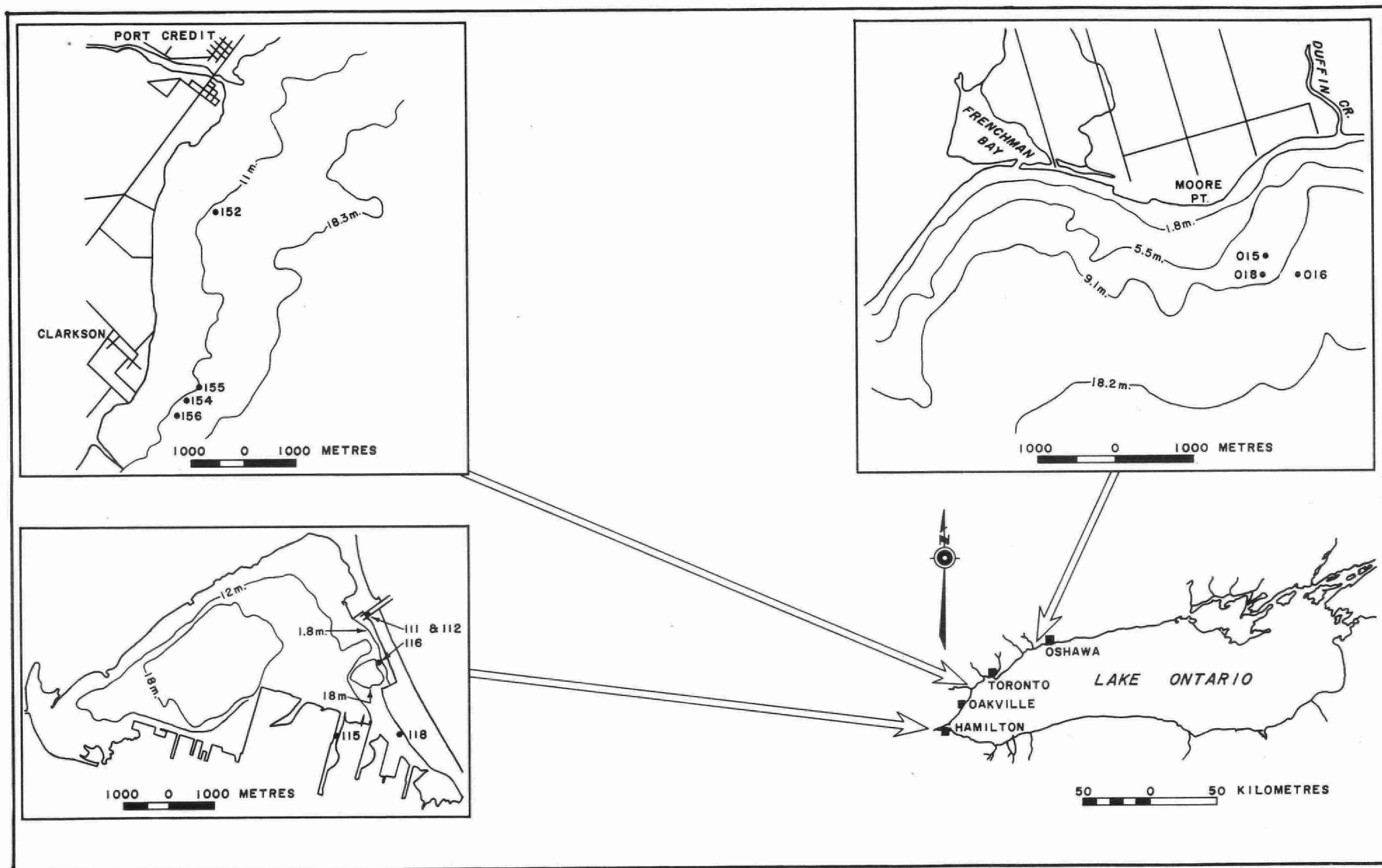


FIGURE 1 : LAKE ONTARIO METER LOCATIONS 1974

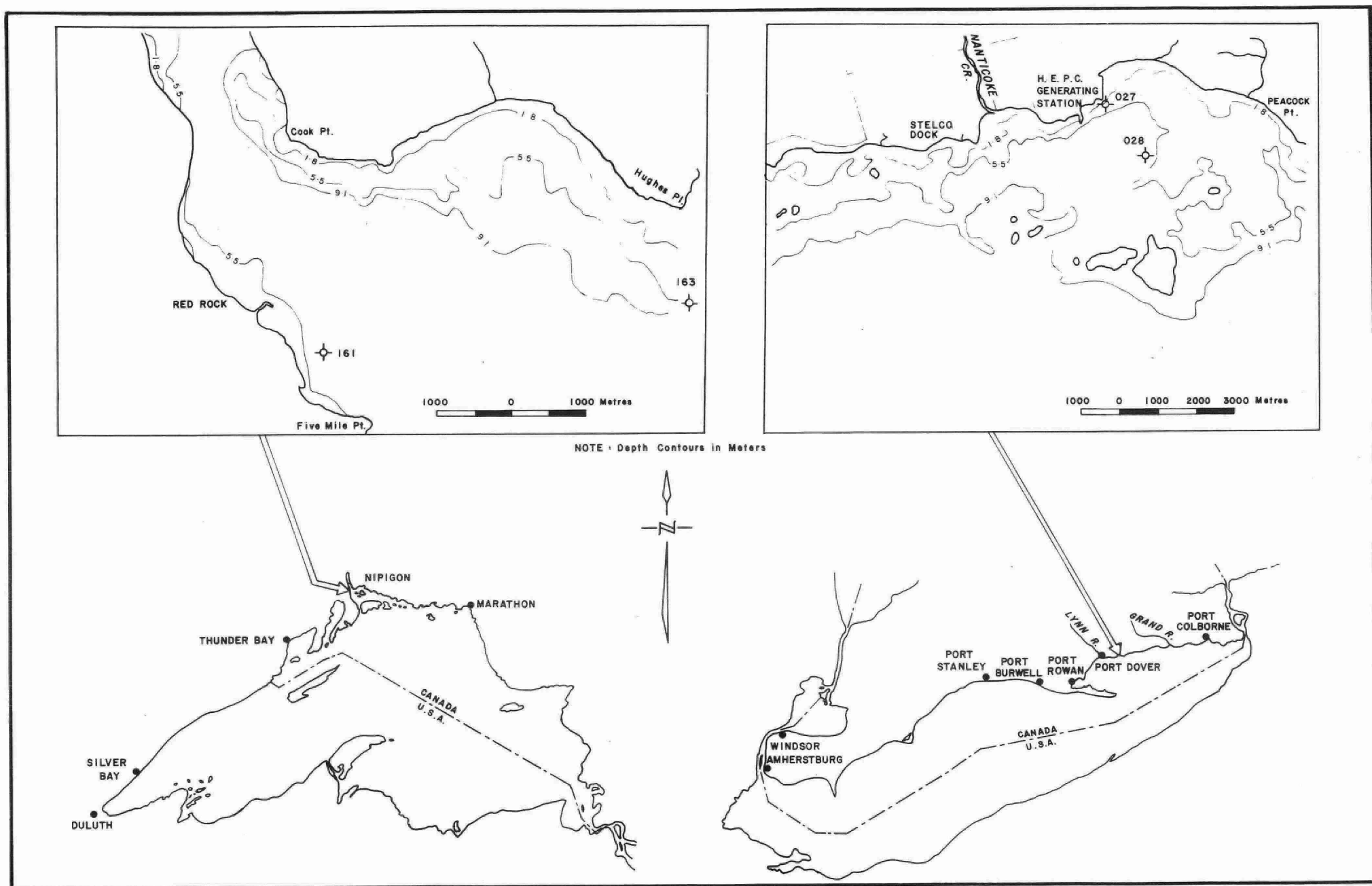


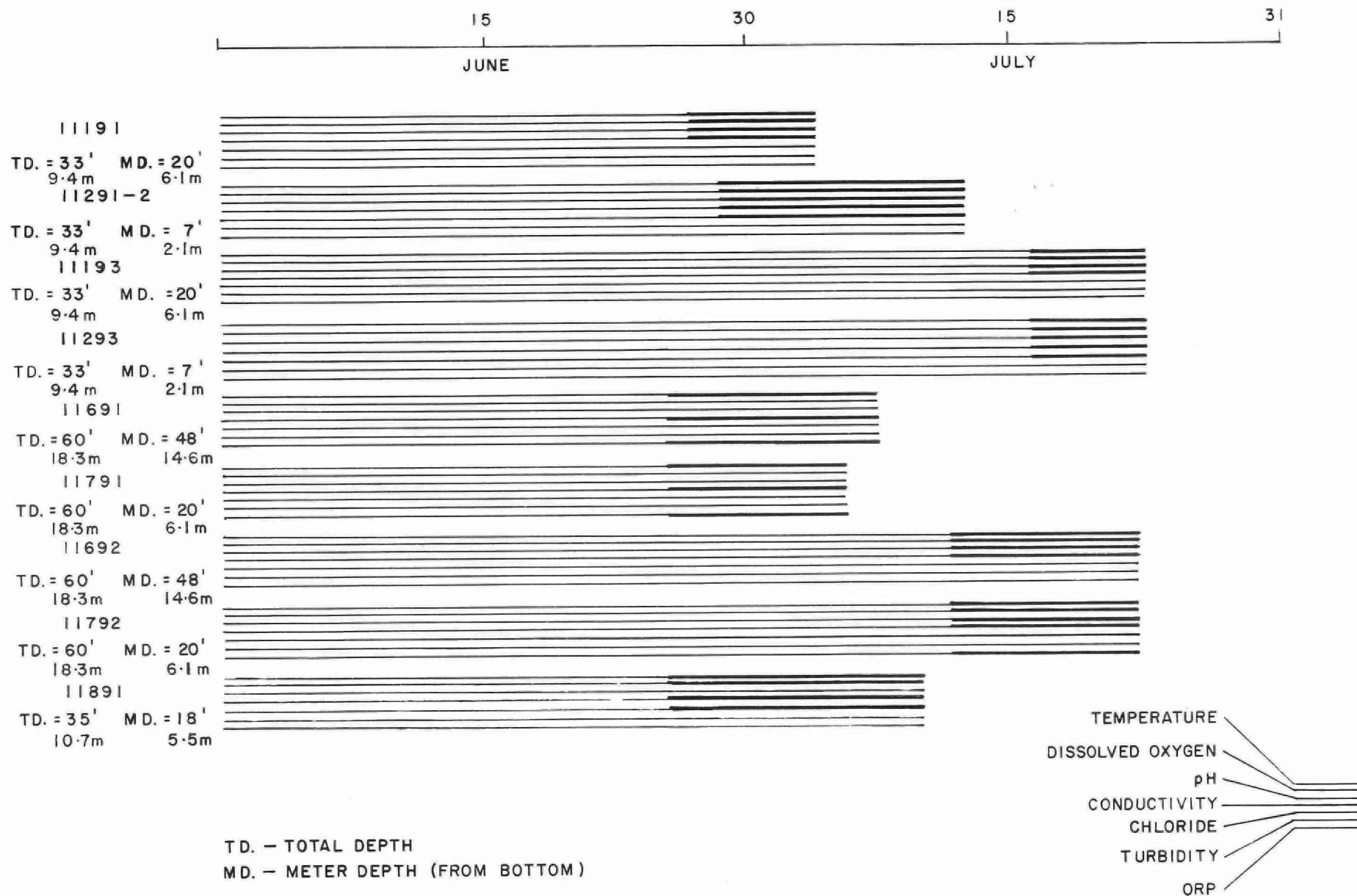
FIGURE 2 : LAKE ERIE AND LAKE SUPERIOR METER LOCATIONS 1974

LOCATION CODE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
112 HAMILTON HARBOUR 79° 47' 55" W 43° 17' 53" N			14	22				
111 HAMILTON HARBOUR 79° 47' 55" W 43° 17' 53" N			14	22				
152 LORNE PARK 79° 35' 12" W 43° 31' 40" N			1		9			
154 LORNE PARK 79° 35' 41" W 43° 23' 42" N			1		31			
155 LORNE PARK 79° 35' 30" W 43° 29' 52" N			1		31			
156 LORNE PARK 79° 35' 51" W 43° 29' 34" N			1		31			
015 PICKERING 79° 02' 22" W 43° 48' 28" N					24		13	
016 PICKERING 79° 02' 04" W 43° 48' 21" N					23		17	
018 PICKERING 79° 02' 25" W 43° 48' 21" N					25		18	

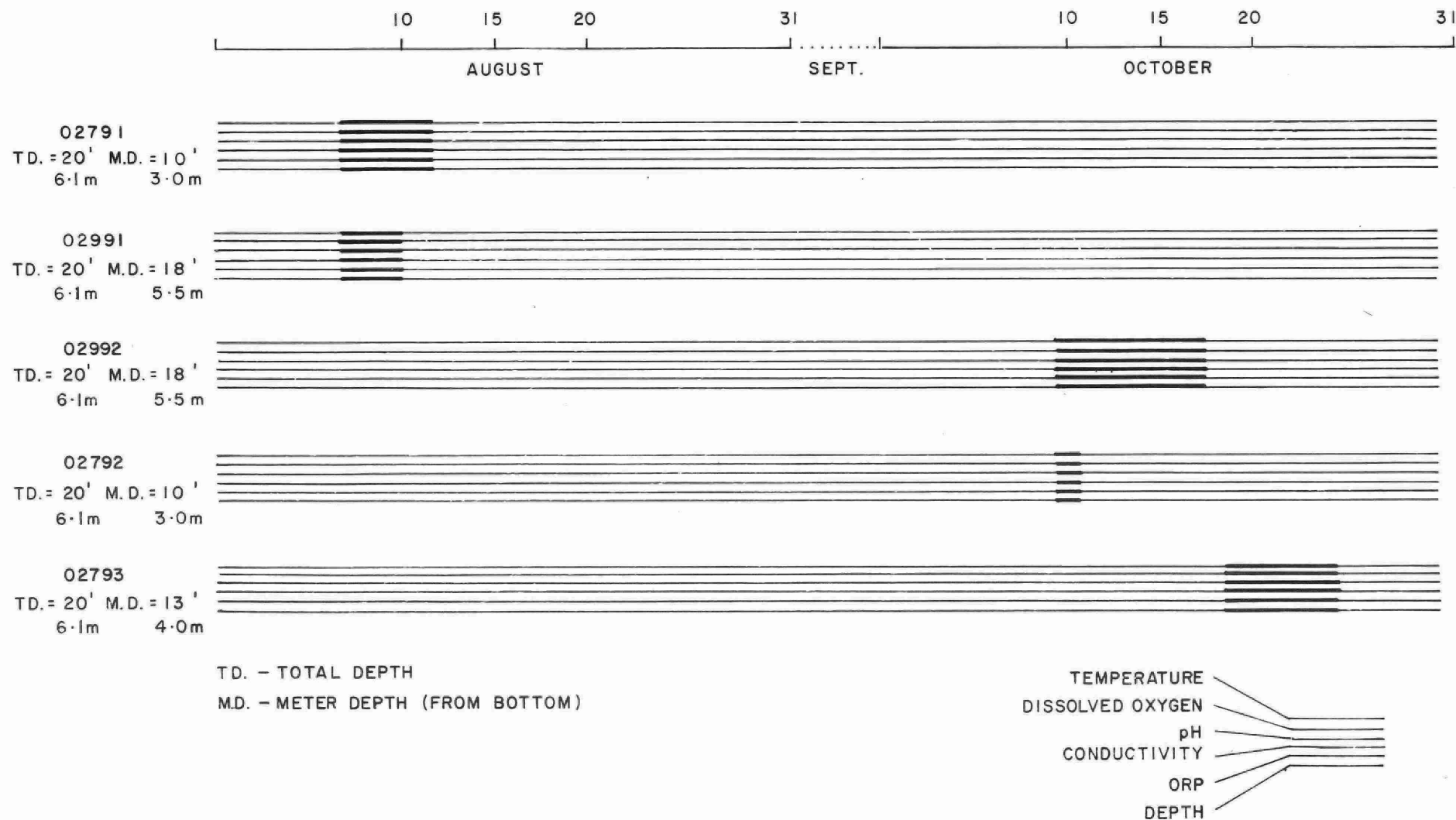
FIGURE 3 : CURRENT METER DATA SUMMARY (LAKE ONTARIO 1974)

LOCATION CODE	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
027 NANTICOKE 80° 02' 17" W 42° 47' 53" N					8	5	12	27
028 NANTICOKE 80° 01' 35" W 42° 47' 21" N	10		27	18 26			11 24	
161 NIPIGON BAY 88° 14' 05" W 48° 56' 08" N				25 15				
163 NIPIGON BAY 88° 09' 52" W 48° 56' 34" N				29	16			
115 HAMILTON HARB. 79° 48' 24" W 43° 16' 30" N			14 18					
116 HAMILTON HARB. 79° 47' 44" W 43° 17' 21" N			14 22					
118 HAMILTON HARB. 79° 47' 24" W 43° 16' 31" N			15 22					

FIGURE 4 : CURRENT METER DATA SUMMARY (LAKES ERIE, SUPERIOR AND ONTARIO 1974)



MINISTRY OF THE ENVIRONMENT  
WATER QUALITY DATA SUMMARY (LAKE ONTARIO 1974)  
FIGURE 5



MINISTRY OF THE ENVIRONMENT  
WATER QUALITY DATA SUMMARY (LAKE ERIE 1974)  
FIGURE 6